

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 23 MARS 2000

WIPO

PCT

Applicant's or agent's file reference RK590	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB99/03116	International filing date (day/month/year) 17/09/1999	Priority date (day/month/year) 17/09/1998
International Patent Classification (IPC) or national classification and IPC H01B3/44		
Applicant RAYCHEM LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  24/12/1999	Date of completion of this report  22.03.00
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Somerville, F  Telephone No. +49 89 2399 8307  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB99/03116

**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

1-7,10-13 as originally filed

8,9 as received on 01/12/1999 with letter of 02/11/1999

**Claims, No.:**

1-20 as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:

☐ the claims, Nos.:

☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N) Yes: Claims 1-20  
No: Claims

Inventive step (IS) Yes: Claims 1-20  
No: Claims

Industrial applicability (IA) Yes: Claims 1-20  
No: Claims

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB99/03116

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2. Citations and explanations

**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**V. Reasoned statement with respect to novelty and inventive step:**

Reference is made to the following document:

D1 = US-A-3269862

- 1). The present Application satisfies the criterion set forth in Article 33(2) PCT since the subject-matter of Claims 1-20 is new in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).

The prior art cited in the International Search Report does not describe insulation comprising cross-linked layers of polyolefin-based material comprising at least 20wt% of a carbonyl-containing polymer (at least 5wt% carboxylic acid ester monomer content) and a PVDF material.

- 2). The present Application satisfies the criterion set forth in Article 33(3) PCT since the subject-matter of Claims 1-20 involves an inventive step (Rule 65(1)(2) PCT).

Document D1 represents the closest prior art to the subject-matter of Claim 1 of the present Application. D1 describes (Claim 1) an insulating material comprising a first layer of cross-linked polyolefin and a second layer of cross-linked PVDF. The polyolefin can be a copolymer of ethylene and vinyl acetate (col.5, last line-col.6, line 2). The layers are preferably irradiated simultaneously (col.2, l.13-15). The subject-matter of present Claim 1 differs from that of D1 in that the polyolefin layer must comprise at least 20wt% of a carbonyl-containing polymer which has at least 5wt% carboxylic acid ester monomer content. The objective technical problem solved in view of D1 (see second Table on page 8 and

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB99/03116

first Table on page 9 of the present Application) is the provision of insulation with improved peel strength. The cited prior art gives no hint that this property could be improved by using a polyolefin material as now specified. It is therefore possible to acknowledge an inventive step for the subject-matter of the present Application.

**VIII. Certain observations on the Application:**

- 1). The peel bond strength is not defined clearly (Art.6, PCT) in either Claim 1 or Claim 2.
- 2). The term "substantially transparent" in Claim 16 is unclear.
- 3). The use of terms such as "preferably" and "especially" in the present claims does not limit their scope in any way.

Example of Effect of Radiation Dose on Bond strength developed between appropriate polyolefin and PVDF-based materials

Material 1	Material 2	Dose(Mrad)	Peel force (N)
EVA copolymer of 25wt% VA content	VDF/HFP copolymer of 10wt% HFP content +7.5wt% additives	0	0.5
Same as above	Same as above	15	40
EEA copolymer of 15wt% EA content	VDF/HFP copolymer of 10wt% HFP content	0	1
EEA copolymer of 15wt% EA content	VDF/HFP copolymer of 10wt% HFP content	8	24
EEA copolymer of 15wt% EA content	VDF/HFP copolymer of 10wt% HFP content	20	52
Ethylene/acrylic ester/maleic anhydride terpolymer of 19wt% acrylic ester content	VDF/HFP copolymer of 10wt% HFP content	0	< 5
Ethylene/acrylic ester/maleic anhydride terpolymer of 19wt% acrylic ester content	VDF/HFP copolymer of 10wt% HFP content	20	21

Example of Effect of Percentage Comonomer in Ethylene Copolymer Material on bond strength to appropriate PVDF-based material after electron beam crosslinking

Material 1	Material 2	Dose(Mrad)	Peel (N)
EMA copolymer with 9wt% MA content	VDF/HFP copolymer of 10wt% HFP content +7.5wt% additives	20	4
EMA copolymer with 28wt% MA content	Same as above	20	45

Example of Effect of percentage Copolymer in a polyolefin polymer blend on bond strength with appropriate PVDF-based material after electron beam crosslinking

Material 1	Material 2	Dose(Mrad)	Peel force (N)
100% HDPE	VDF/HFP copolymer of 10wt% HFP content +7.5wt% additives	20	0
20% HDPE + 80% EEA copolymer of 15wt% EA content	Same as above	20	70

Example of Effect of PVDF-based material type on bond strength with appropriate polyolefin based material after electron beam crosslinking

Material 1	Material 2	Dose(Mrad)	Peel (N)
EVA copolymer with 25wt% VA content	PVDF homopolymer	15	4
As above	VDF/HFP copolymer of 10wt% HFP content	15	17.5

Example of Effect of the addition of Pro-rad in Olefinic Material on bond strength with appropriate PVDF-based material after electron beam crosslinking

Material 1	Material 2	Dose(Mrad)	Peel (N)
20% HDPE + 80% EEA copolymer of 15wt% EA content	VDF/HFP copolymer of 10wt% HFP content +7.5wt% additives	20	70
19% HDPE + 77%EEA copolymer of 15wt% EA content + 4% TMPTM pro-rad	Same as above	20	> 130

Examples of Wire Construction

An electrical wire in which the insulation consists of two polymeric layers bonded together according to the present invention was made as follows:

## PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

COMMUNICATION IN CASES FOR WHICH  
NO OTHER FORM IS APPLICABLE

To:

JAY, Anthony, W.  
Raychem Limited  
IPLD  
Faraday Road  
Dorcan, Swindon  
Wiltshire SN3 5HH  
ROYAUME-UNI

Date of mailing ( <i>day/month/year</i> ) 07 December 1999 (07.12.99)	
Applicant's or agent's file reference RK590	<b>REPLY DUE</b> see paragraph 1 below
International application No. PCT/GB99/03116	International filing date ( <i>day/month/year</i> ) 17 September 1999 (17.09.99)
Applicant RAYCHEM LIMITED	

1. ☐ REPLY DUE within \_\_\_\_\_ months/days from the above date of mailing
- ☐ NO REPLY DUE, however, see below
- ☒ IMPORTANT COMMUNICATION
- ☐ INFORMATION ONLY

## 2. COMMUNICATION:

The applicant in respect of the above identified international application is notified that the receiving Office (RO/GB) has stamped an incorrect international filing date on the first and last pages of the request and has now informed the International Bureau of the corrected date

Please correct all notifications previously sent by the International Bureau to indicate the correct filing date of: **17 September 1999**

instead of: **20 September 1999**

Form PCT/IB/316 is now considered null and void.

A copy of this notification has been sent to the receiving Office (RO/GB), the International Searching Authority (ISA/EP) and all designated Offices already informed of their designation.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer F. Gateau
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38



## PCT INTERNATIONAL COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

JAY, Anthony, W.  
TYCO ELECTRONICS UK LIMITED  
IPLD  
Faraday Road  
Dorcan, Swindon  
Wiltshire SN3 5HH  
ROYAUME-UNI

Date of mailing (day/month/year) 19 February 2001 (19.02.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference RK590	
International application No. PCT/GB99/03116	International filing date (day/month/year) 17 September 1999 (17.09.99)

## 1. The following indications appeared on record concerning:

☒ the applicant
 ☐ the inventor
 ☐ the agent
 ☐ the common representative

## Name and Address

RAYCHEM LIMITED  
Faraday Road  
Dorcan  
Swindon  
Wiltshire SN3 5HH  
United Kingdom

## State of Nationality

GB

## State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person
 ☒ the name
 ☐ the address
 ☐ the nationality
 ☐ the residence

## Name and Address

TYCO ELECTRONICS UK LIMITED  
Faraday Road  
Dorcan  
Swindon  
Wiltshire SN3 5HH  
United Kingdom

## State of Nationality

GB

## State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

## 3. Further observations, if necessary:

THE AGENT'S ADDRESS HAS BEEN CHANGED, ACCORDINGLY.

## 4. A copy of this notification has been sent to:

☒ the receiving Office
 ☐ the designated Offices concerned  
☐ the International Searching Authority
 ☒ the elected Offices concerned  
☐ the International Preliminary Examining Authority
 ☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Eugénia Santos Telephone No.: (41-22) 338.83.38
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## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing:

30 March 2000 (30.03.00)

International application No.:

PCT/GB99/03116

Applicant's or agent's file reference:

RK590

International filing date:

17 September 1999 (17.09.99)

Priority date:

17 September 1998 (17.09.98)

Applicant:

RODWAY, Giles, Henry

1. The designated Office is hereby notified of its election made:



in the demand filed with the International preliminary Examining Authority on:

24 December 1999 (24.12.99)



in a notice effecting later election filed with the International Bureau on:

2. The election



was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer:

J. Zahra

Telephone No.: (41-22) 338.83.38

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>RK590</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 99/ 03116</b>	International filing date (day/month/year) <b>17/09/1999</b>	(Earliest) Priority Date (day/month/year) <b>17/09/1998</b>
Applicant <b>RAYCHEM LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures.

## INTERNATIONAL SEARCH REPORT

National Application No

PCT/GB 99/03116

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01B3/44 H01B7/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 269 862 A (LANZA V L, STIVERS E C) 30 August 1966 (1966-08-30) column 5, line 63 -column 6, line 2; examples 1-3 ----	1,2,17
A	US 3 650 827 A (BROWN CHESTER A ET AL) 21 March 1972 (1972-03-21) column 1, line 25 - line 38 ----	1,2,17
A	EP 0 528 611 A (CHAMPLAIN CABLE CORP) 24 February 1993 (1993-02-24) example 1 ----	1,2,17
A	US 5 589 028 A (ROBINSON DONALD N ET AL) 31 December 1996 (1996-12-31) cited in the application the whole document -----	1,2,17

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## ° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

18/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Shade, M

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03116

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3269862	A	30-08-1966	NONE	
US 3650827	A	21-03-1972	NONE	
EP 0528611	A	24-02-1993	US 5206459 A	27-04-1993
			JP 5205536 A	13-08-1993
			US 5262591 A	16-11-1993
			US 5313017 A	17-05-1994
			US 5262592 A	16-11-1993
US 5589028	A	31-12-1996	BE 1010238 A	07-04-1998
			CA 2156659 A	04-05-1996

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>H01B 3/44, 7/02</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/17889</b> <b>(43) International Publication Date:</b> 30 March 2000 (30.03.00)
<b>(1) International Application Number:</b> PCT/GB99/03116 <b>(22) International Filing Date:</b> 17 September 1999 (17.09.99) <b>(30) Priority Data:</b> 9820214.6 17 September 1998 (17.09.98) GB <b>(71) Applicant (for all designated States except US):</b> RAYCHEM LIMITED [GB/GB]; Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> RODWAY, Giles, Henry [GB/GB]; The Old School, 20B The Green, Calne, Wiltshire SN11 8DJ (GB). <b>(74) Agent:</b> JAY, Anthony, W.; Raychem Limited, IPLD, Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB).		<b>(81) Designated States:</b> AU, BR, CA, CN, CZ, HU, ID, IL, IN, JP, KR, MX, NO, PL, RO, RU, TR, US, ZA, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

**(54) Title:** ELECTRICAL WIRE INSULATION**(57) Abstract**

An electrical wire or cable having insulation comprising (i) at least a first layer of a polyolefin-based formulation, of which at least 20 %, preferably at least 40 %, more preferably at least 60 % or very preferably at least 80 % of the weight of the polymeric portion of the said formulation consists of a carbonyl-containing polymer (homopolymer or copolymer or terpolymer), of which polymer the or at least one constituent monomer is a carboxylic acid ester, preferably an acrylate or acetate, especially an alkyl acrylate (preferably methyl acrylate, ethyl acrylate, propyl acrylate or butyl acrylate), the said monomer itself constituting at least 5 %, preferably at least 9 %, more preferably at least 15 % by weight of the said co-, or ter- polymer when used, and the remainder or the majority of the remainder of the said co-, or ter- polymer preferably being derived from olefinic monomer, preferably ethylene; in contact with (ii) at least a second layer of another material formulation, containing at least 10 %, more preferably at least 50 %, very preferably at least 90 %, especially 100 %, by weight of the second layer, of polyvinylidene fluoride (PVDF), or especially preferably a copolymer based on VDF with a partially or fully fluorinated co-monomer, most preferably a copolymer of VDF and hexafluoropropylene (HFP); wherein the said layers (i) and (ii) whilst in contact with each other have been subjected to cross-linking reaction, preferably by radiation, more preferably ionising radiation, sufficient to prevent delamination of the two layers during a 1 hour acetone immersion test at 23 °C, or to increase the peel bond strength between the said layers to at least 5N according to the ASTM B1876-95 method described below preferably increasing the bond strength by at least 50 %, more preferably by at least 100 %, especially by at least 500 % or 1000 %, compared to that between the uncrosslinked layers.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

# INTERNATIONAL SEARCH REPORT

Internatic Application No

PCT/GB 99/03116

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H01B3/44 H01B7/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 269 862 A (LANZA V L, STIVERS E C) 30 August 1966 (1966-08-30) column 5, line 63 -column 6, line 2; examples 1-3 ---	1,2,17
A	US 3 650 827 A (BROWN CHESTER A ET AL) 21 March 1972 (1972-03-21) column 1, line 25 - line 38 ---	1,2,17
A	EP 0 528 611 A (CHAMPLAIN CABLE CORP) 24 February 1993 (1993-02-24) example 1 ---	1,2,17
A	US 5 589 028 A (ROBINSON DONALD N ET AL) 31 December 1996 (1996-12-31) cited in the application the whole document -----	1,2,17

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

18/01/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Shade, M



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03116

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3269862	A	30-08-1966	NONE	
US 3650827	A	21-03-1972	NONE	
EP 0528611	A	24-02-1993	US 5206459 A	27-04-1993
			JP 5205536 A	13-08-1993
			US 5262591 A	16-11-1993
			US 5313017 A	17-05-1994
			US 5262592 A	16-11-1993
US 5589028	A	31-12-1996	BE 1010238 A	07-04-1998
			CA 2156659 A	04-05-1996